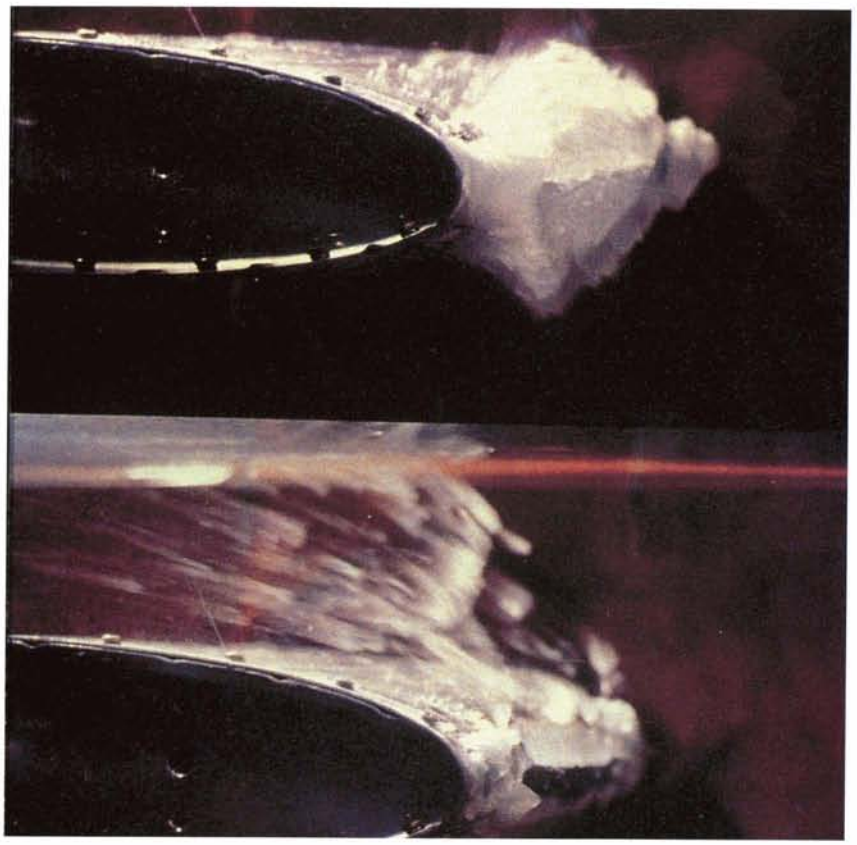
Ice Protection

Ice buildup — or "accretion" — on the wings of aircraft represents a potential source of accidents or damage to airplanes. Therefore any innovation that promises greater deicing efficiency is of special interest to airline operators, the military services, aircraft manufacturers and public safety agencies.

Now commercially available is a new ice removal system designed to overcome some of the limitations of existing electro-thermal deicers. Originally developed by Ames Research Center, the system was refined by DNE Technologies, Inc., Wallingford, Connecticut and is being marketed by DNE under a NASA license.



The system employs a technique known as expulsive ice shedding. Expulsive separation "blankets" are applied to an aerodynamic surface subject to ice accretion — a wing, helicopter rotor or engine inlet, for example — and the blankets protect the surface by mechanically expelling the ice periodically. The force to expel the ice is developed magnetically by passing a strong direct current pulse through conductors embedded in the blanket; this causes an explosive expansion of the blanket that ejects the ice on the aerodynamic surface.

"Expulsive blankets have the ability to cleanly shed all forms of meteorological ice at virtually any thickness," DNE officials say. The system has been proved effective in a variety of icing tunnels and in natural icing conditions. The sequential photos show a DNE tunnel test of the expulsive separation system on an ice-covered aircraft wing segment. In the **top photo**, the system has just been activated; in the **lower photo**, taken less than a millisecond later, most of the ice has been pulverized and ejected.

DNE substantially modified the Ames technology to make the system commercially viable. Among refinements are extended service life, achieved by controlling internal conductor deformation in a manner that virtually eliminates conductor metal fatigue; improvement of blanket efficiency by better conversion of electrical energy to mechanical energy; blanket level redundancy; and a sharp reduction in the size and weight of the blanket's electronic controllers. The laboratory development system of 1988 needed a power supply that weighed nearly 40 pounds for eight square feet of blanket; the advanced system's power supply drives 16 square feet of blanket and weighs less than 10 pounds.